



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS 2018/2019 ACADEMIC YEAR SECOND YEAR, SECOND SEMESTER

**SCHOOL OF SCIENCE
BACHELOR OF SCIENCE CHEMISTRY**

COURSE CODE: CHE 2213

**COURSE TITLE: TRANSITION METAL
CHEMISTRY**

DATE: 24/4/2019

TIME: 1430 – 1630 HRS

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **TWO** questions in section **B**
2. No writing on the Question paper

Question One (20 marks)

- a. Define the following terms **(8 Marks)**
i.Coordination number
ii.Ligand
iii.Chelate
iv.Paramagnetism
- b. Giving examples name any three types of ligands **(6 Marks)**
- c. Briefly describe how you can achieve separation of niobium and tantalums if you are supplied with an ore containing the two elements. **(6 Marks)**
- d. Write own the oxidation state and the electronic configuration of the metal in each of the following ions; $\text{Cu}(\text{NH}_3)_4^{2+}$, TaO_4^{3-} , OsO_4 and ZrOF_3^- (Cu=29, Ta=73, Os=76 and Z=40) **(6 Marks)**
- e. Give the electronic configuration of the following species. **(4 Marks)**
i) Niobium (iv)
ii) Manganese (ii)
iii) Iron (iii)
iv) Zirconium (ii)

Question Two (20 marks)

- a. Briefly explain the following observations;
i. Whereas $\text{Ni}(\text{CO})_4$ is known, $\text{Ca}(\text{CO})_4$ is not known. **(3 Marks)**
ii. When AgNO_3 is added to a solution of NbCl_3 in water only a third of the halide ions is precipitated as AgCl . **(4 Marks)**
- b. Briefly explain why the zinc group of elements (group2) is not classified among transition elements. **(5 Marks)**
- c. Explain why in any given group of transition metals, stability of higher oxidation states increases with increasing atomic number. **(8 Marks)**

Question Three (20 marks)

- a. Explain why TiO_2 is preferred to PbCO_3 and Pb(OH)_2 as white paint pigment.
(4 Marks)
- b. Describe the sulphate processes of producing pigment grade TiO_2
(6 Marks)
- c. Name four other industrial uses of titanium and give a reason for each use.
(4 Marks)
- d. i) Generally transition metal have high thermal and electrical conductivity, tensile strength, density and melting points.
(4 Marks)

ii) Most industrial catalysts are either transition metals or their compounds.
(2 Marks)

Question Four (20 marks)

- a. State and explain the general trend down the group for each of the following properties in transition elements;
 - i. Density
 - ii. Ionization energy
 - iii. Polarizing power.**(9 Marks).**
- b. Write a balanced and net ionic equation when a solution of $\text{Na}_2\text{Cr}_2\text{O}_7$ turns from orange to yellow on addition of an alkali.
(3 Marks)
- c. Explain why the third row of the d-block elements have only marginally larger atomic radii than the second row elements.
(3 Marks)
- d. Explain why metallic tantalum is used to repair badly damaged bones while metallic calcium cannot be used even though bone is a compound of calcium.
(5 Marks)

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